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Taxonomic notes on Japanese species of the genera *Pseudicius* and *Tasa* (Araneae: Salticidae)

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Abstract — Japanese salticid species of the genus *Tasa* and a part of the genus *Pseudicius* are taxonomically revised by morphological investigation and molecular analysis using partial sequencing data of mt-DNA COI gene. As a result, the female of *Pseudicius koreanus* Wesołowska 1981 and the male of *Tasa nipponica* Bohdanowicz & Prószyński 1987 are identified as the same species. Therefore, *T. nipponica* is newly synonymized with *P. koreanus*, and *P. koreanus* is transferred to the genus *Tasa*, due to its male genital morphology. The male of *P. koreanus* sensu Bohdanowicz & Prószyński (1987) is identified as the male of *Pseudicius tokaraensis* (Bohdanowicz & Prószyński 1987). Incidentally, *P. okinawaensis* Prószyński 1992 is newly synonymized with *P. tokaraensis*. Additionally, *Pseudicius kimjoopili* (Kim 1995) comb. nov. is newly recorded from Japan. The male of this species is described for the first time. This species is transferred from the genus *Helicius*. After these taxonomic revisions, Japanese *Pseudicius* species are following three for the present: *P. kimjoopili*, *P. tokaraensis* and *P. vulpes*. These three can be easily distinguished from each other by their general appearances or genital morphologies.

Key words — Taxonomy, *Pseudicius*, *Tasa*, new combination, new synonymy, DNA bar-coding, conspecific pair

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Introduction

Pseudicius Simon 1885 is a salticid genus which includes about 100 species mainly from the Old World (Platnick 2014). In Japan, at present, four species have been known (Ono et al. 2009): *P. koreanus* Wesołowska 1981, *P. okinawaensis* Prószyński 1992, *P. tokaraensis* (Bohdanowicz & Prószyński 1987) and *P. vulpes* (Grube 1861). Of these, *Pseudicius koreanus* Wesołowska 1981 was originally described with the female holotype from North Korea. Later, Bohdanowicz & Prószyński (1987) recorded the male specimens of this species from Kochi Pref., Japan. Furthermore, Xiao (1993) redescribed this species on the basis of a male specimen from China although the specimen is apparently different from the male in Bohdanowicz & Prószyński (1987).

In our preliminary study, females of *P. koreanus* were collected, often together with male of *Tasa nipponica* Bohdanowicz & Prószyński 1987 which is known only with male, instead of males of *P. koreanus* in the same locality. And males of *P. koreanus* seusu Bohdanowicz & Prószyński (1987) were collected, often together with females of *P. tokaraensis* (Bohdanowicz & Prószyński 1987) which is known only with female, instead of those of *P. koreanus* in the same locality. These facts suggest that females of *P. tokaraensis* and males of *P. koreanus* sensu Bohdanowicz & Prószyński (1987), and males of *Tasa nipponica* and females of *P. koreanus* are conspecific respectively. To clarify their relationship, we review Japanese species of the genus *Tasa* and a part of the genus *Pseudicius* by morphological investigation and molecular analysis. We also review the taxonomic status of *Helicius kimjoopili* Kim 1995 which is newly obtained from Japan, because whose morphology is closely resembles some *Pseudicius* species. Male of this species is described here for the first time.

The voucher specimens are deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

The following abbreviations are used: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye; RTA, retrolateral tibial apophysis.

Phylogeny

Species analized. The species used for the analysis and their sampling data are as shown in Appendix. To confirm

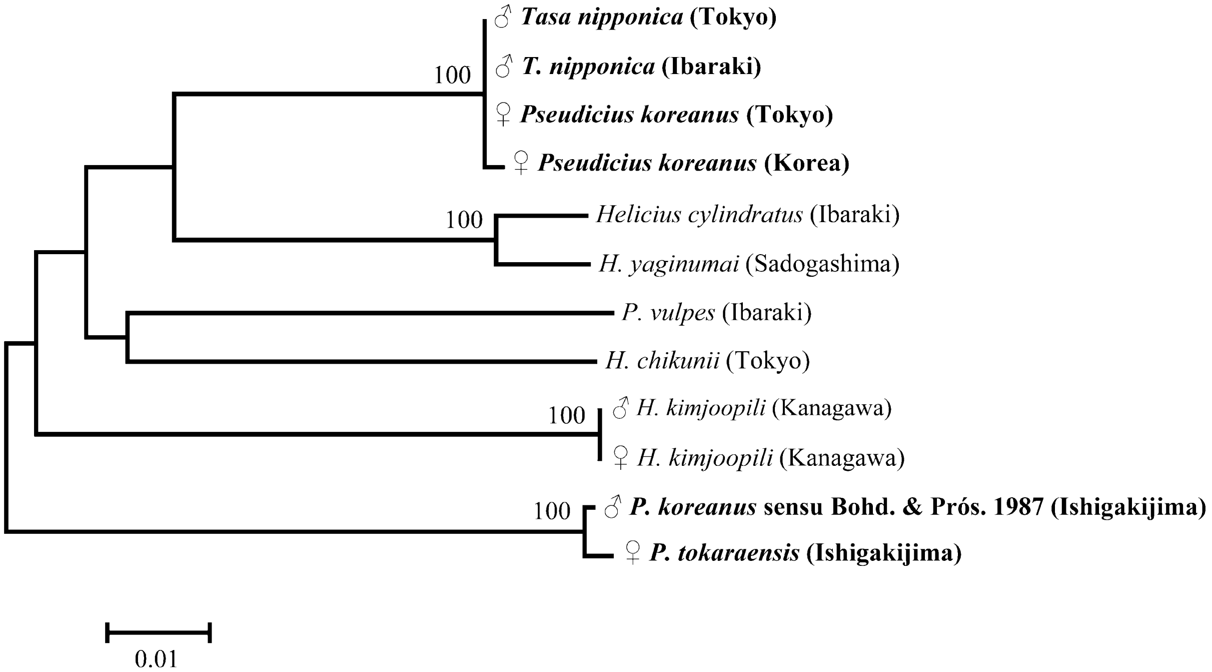

♂ Tasa nipponica (Tokyo)
♂ T. nipponica (Ibaraki)
♀ Pseudicius koreanus (Tokyo)
♀ Pseudicius koreanus (Korea)
Helicius cylindratus (Ibaraki)
H. yaginumai (Sadogashima)
P. vulpes (Ibaraki)
H. chikunii (Tokyo)
♂ H. kimjoopili (Kanagawa)
♀ H. kimjoopili (Kanagawa)
♂ P. koreanus sensu Bohd. & Prós. 1987 (Ishigakijima)
♀ P. tokaraensis (Ishigakijima)
100
100
100
100
0.01

Fig. 1. Unrooted bootstrap consensus tree obtained by Neighbor Joining method for the species examined. Scores at each node are bootstrap value (1000 replicates, less than 90 omitted). Scale bar shows substitution per site.

conspecific pairs of male and female, *Helicius kimjoopili*, *Pseudicius koreanus*, *P. tokaraensis*, *Tasa nipponica* and all known species of the genera *Helicius* and *Pseudicius* in Japan were included.

DNA extraction, polymerase chain reaction, sequencing and data analysis. Specimens were preserved in 80% ethanol, and genomic DNA was extracted from muscle of legs using DNeasy Blood & Tissue kit (Qiagen, Inc.). The mitochondrial cytochrome oxidase subunit I (mt-COI) partial sequences were amplified using the primer combination LCO-1490: 5'—GGT CAA CAA ATC ATA AAG ATA TTG G—3' with HCO-2198: 5'—TAA ACT TCA GGG TGA CCA AAA AAT CA—3' (Folmer et al. 1994). For only *Helicius kimjoopili*, the reverse primer of HE-COI-rev: 5'—CAT AAT GGA AAT GAG CTA CAA C—3' which had been made for isopods (Niikura pers. com.) was used. The reactants were initially denatured for 5 min at 94°C, proceeded with 35 cycles of 1 min at 94°C, 1 min at 40°C, 1 min at 72°C and then the final extension at 72°C for 5 min. The bands of interest were cut and purified using NucleoTrap gel extraction kit (Macherey-Nagel). Later, the reactants were exposed to additional PCR reaction of denaturing for 1 min at 94°C, 30 cycles of 30 sec at 94°C, 30 sec at 55°C, 1 min at 72°C and then the final extension at 72°C for 5 min. PCR products were purified using illustra ExoStar purification kit (GE Healthcare Japan). The purified PCR products were sequenced using the BigDye terminator cycle sequencing kit (ver. 3.1) using the primer LCO-1490 and HCO-2198, except reverse primer HE-COI-rev for *Helicius kimjoopili*, and analyzed on ABI 3730 xl DNA analyzer. Chromatograms were checked by eye using BioEdit Ver. 7.0.8 (Hall 1999). Sequence alignments were done by Clustal W program (Thompson et al. 1994) in MEGA version 5.05 (Tamura et al. 2011). Overall mean p-distance was calculated using MEGA by averaging the number of base differences per site over all sequence pairs. The phylogenetic tree was constructed by Neighbor Joining method using MEGA version 5.05 (Tamura et al. 2011).

Results and conclusion. We obtained 557 bp of mt-COI partial sequences from the specimens used. The obtained unrooted NJ tree is shown in Fig. 1. Females of *Pesudicius koreanus* were united with males of *Tasa nipponica*. On the other hand, male of *P. koreanus* sensu Bohdanowicz & Prószyński (1987) made a well-supported monophyletic clade with female of *P. tokaraensis*. P-distance (the number of nucleotide differences divided by total number of nucleotides) of male *P. koreanus* sensu Bohdanowicz & Prószyń ski (1987) from female *P. tokaraensis* was 0.004, whereas those from female *P. koreanus* and male *T. nipponica* were 0.108–0.110. Male and female of *Helicius kimjoopili* shared the same sequences, and they made well-supported clade with neither Japanese *Pseudicius* nor *Helicius* species.

From these results, we conclude that female of *P. koreanus* and male of *T. nipponica* are conspecific pair, and male of *P. koreanus* sensu Bohdanowicz & Prószyński (1987) and female of *P. tokaraensis* are another conspecific pair.

Taxonomy

Genus *Pseudicius* Simon 1885
[Japanese name: Inazuma-haetorigumo-zoku]

Pseudicius Simon 1885, p. 28; Type species: *Aranea encarpata* Walckenaer 1802, type locality unknown.

Remarks. This genus contains many heterogeneous species, and requires an extensive taxonomic revision. After that, Japanese three species: *P. kimjoopili* comb. nov., *P. tokaraensis* and *P. vulpes* will be placed in independent genera respectively.

Pseudicius kimjoopili (Kim 1995) comb. nov.
[Japanese name: Kumoma-haetori]
(Figs. 2–9)

Helicius kimjoopili Kim 1995, p. 2, figs. 1–5 (female holotype from Korea: Incheon, deposited in the Arachnological Institute of Korea, not examined).

Specimens examined. All the specimens were collected in Japan. Tokyo: 1♂ (NSMT-Ar 13044), Kikkake, Akiruno-shi, 27-IV-2013, K. Arai leg. Kanagawa Pref.: 2♂ 2♀ (1♀: NSMT-Ar 13045), Shiboku-honchô, Miyamae-ku, Kawasaki-shi, 23-VI-2012 (1♂), 25-V-2013 (1♂ 2♀), T. Suguro leg.

Diagnosis. Compared with other Japanese *Pseudicius* species, this species can be easily distinguished by following points: a pair of dark-colored band on abdominal dorsum in both sexes (Figs. 2–5); male palp with concaved embolus and thin small RTA (Figs. 6–7); epigyne with a pair of round openings and visible paired internal canals which are strongly curving forward (Fig. 8).

Description. Based on 1♂ (NSMT-Ar 13044, Fig. 2) and 1♀ (NSMT-Ar 13045, Fig. 3) from Japan.

Male. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 3.98 (3.85–4.63) long; carapace 1.93 (1.75–2.23) long; 1.37 (1.23–1.60) wide; 0.87 (0.77–0.95) high; abdomen 2.05 (2.05–2.40) long; 1.17 (1.05–1.30) wide. Eye field: eye row I 1.07 (1.00–1.22) wide; eye row III 1.10 (1.02–1.27) wide; eye row 0.73 (0.70–0.83) long; distance between eye row I and II/length of eye row 0.50 (0.50–0.56); width of eye row I/width of eye row III 0.97 (0.96–0.98); AME diameter 0.35 (0.33–0.38); ALE/AME 0.43 (0.40–0.43); ALE/PLE 1.00 (0.89–1.00); PME/PLE 0.22 (0.20–0.22). Length of legs [femur＋patella＋tibia＋metatarsus＋tarsus＝total]: I 1.28＋0.78＋1.03＋0.60＋0.40＝4.10; II 0.90＋0.52＋0.63＋0.43＋0.35＝2.83; III 0.88＋0.42＋0.55＋0.60＋0.37＝2.82; IV 1.07＋0.48＋0.73＋0.70＋0.40＝3.38.

Carapace rather flat, height/width 0.63 (0.59–0.63), with short longitudinal fovea. Chelicera short, with two promarginal and one retromarginal teeth. Spination of legs as shown in Table 1. Abdomen elongate.

Palp (Figs. 6–7). Embolus thick and concaved. RTA thin and short.

Coloration and markings (Figs. 2, 4). Carapace mostly brown, brighter on lateral sides and the middle of thorax, entirely covered with sparse black and white hairs, with white line fringed with white hairs running along lateral margins. Anterior and lateral margins of eye field dark blackish brown and surrounded by sparse black setae. Eyes surrounded by brown and thick white hairs. Clypeus brown with black hairs. Chelicera, labium, maxilla and sternum bright brown. Dorsum of abdomen yellowish white, entirely covered with black and white hairs, with greyish brown pigmented markings: short thin longitudinal line on the midline, and a pair of thick longitudinal bands which is posteriorly fragmented. Anterior margin of abdomen with long hairs. Venter of abdomen greyish brown, covered with sparse black hairs. Spinnerets greyish brown. Leg I mostly dark brown except yellowish white tarsus and some yellowish brown parts: dorsa of femur, patella, tibia and metatarsus, and venters of femur and metatarsus. Legs II–IV entirely yellowish white. Palp mostly dark yellowish brown except black embolus.

Female. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 4.83 (4.10–4.83) long; carapace 2.03 (1.78–2.03) long; 1.43 (1.27–1.43) wide; 0.88 (0.77–0.88) high; abdomen 2.80 (2.33–2.80) long; 1.70 (1.33–1.70) wide. Eye field: eye row I 1.17 (1.05–1.17) wide; eye row III 1.23 (1.08–1.23) wide; eye row 0.78 (0.72–0.78) long; distance between eye row I and II/length of eye row 0.49 (0.49–0.49); width of eye row I/width of eye row III 0.95 (0.95–0.97); AME diameter 0.38 (0.33–0.38); ALE/AME 0.43 (0.43–0.45); ALE/PLE 1.00 (1.00–1.00); PME/PLE 0.20 (0.20–0.22). Length of legs [femur＋patella＋tibia＋metatarsus＋tarsus＝total]: I 0.97＋0.65＋0.63＋0.52＋0.35＝3.12; II 0.85＋0.53＋0.52＋0.43＋0.33＝2.67; III 0.90＋0.48＋0.50＋0.63＋0.42＝2.93; IV 1.15＋0.58＋0.77＋0.85＋0.40＝3.75.

Carapace rather flat, height/width 0.62 (0.61–0.62), with short longitudinal fovea. Chelicera short, with two promarginal and one retromarginal teeth. Spination of legs as shown in Table 1. Abdomen elongate.

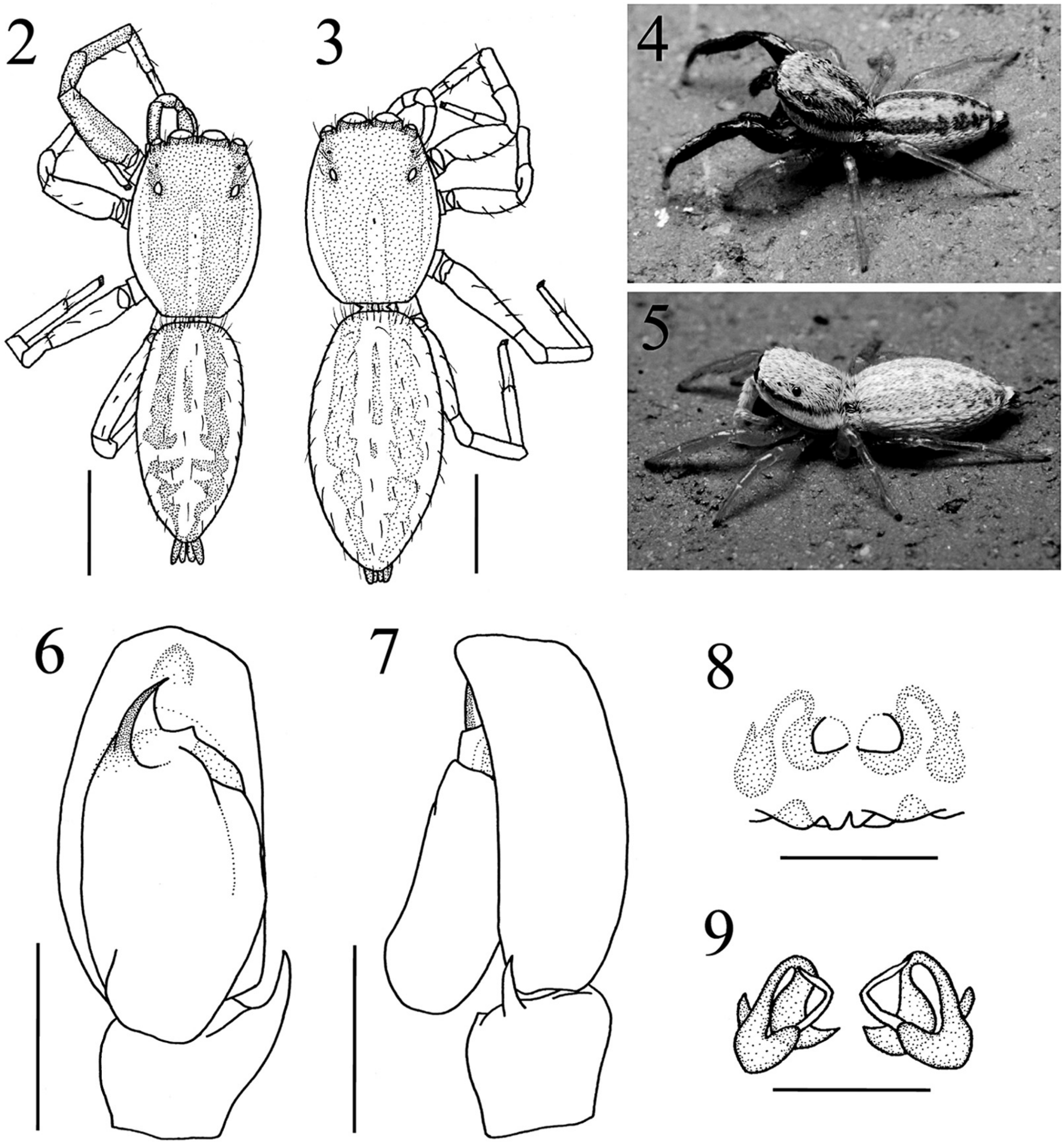
Genitalia (Figs. 8–9). Epigyne with a pair of round copulatory openings and a pair of pockets on the rear. Internal canal strongly curving forward and visible through epigynal surface.

Coloration and markings (Figs. 3, 5). Generally similar to male but rather lighter. Clypeus with dense white hairs. Legs and palp entirely yellowish white.

Distribution. Japan (new record): Tokyo, Kanawaga Pref.; Korea.

Remarks. Male and female are considered conspecific because they have the same abdominal markings, and they were collected at the same place in Kanagawa Pref. Also, sequencing data of mt-DNA COI gene are consistent (See the section of “Phylogeny” in this paper).

Although the holotype of this species described from



Figs. 2–9. *Pseudicius kimjoopili* (Kim 1995) comb. nov. 2–3, dorsal view (2, male; 3, female); 4–5, habitus (4, male; 5, female); 6–7, male palp (6, ventral view; 7, retrolateral view); 8, epigyne; 9, female internal genitalia, dorsal view. (2, 4, 6–7, NSMT-Ar 13044; 3, 5, 8–9, NSMT-Ar 13045.) Scales = 1.0 mm (2–3); 0.2 mm (6–9).

Korea was not examined, Japanese specimens certainly agreed with the description in Kim (1995).

This species was originally described as a member of the genus *Helicius*, whose members share male palps with the large plate-like RTAs and the ventrally protuberated femora. On the other hand, male palp of this species has thin small RTA and not-protuberated femur. The structures of male and female genitals of this species indicate its close relationship to *Pseudicius szechuanensis* Logunov 1995 and *P. wesolowskae* Song et al. 2001. Therefore, for the present, we place this species in the genus *Pseudicius*. Male of this species is recorded with the description for the first time.

Pseudicius tokaraensis (Bohdanowicz & Prószyński 1987)
[Japanese name: Tokara-haetori]
(Figs. 10, 11; 16–24)

Icius tokaraensis Bohdanowicz & Prószyński 1987, p. 71, figs. 77–80 [female holotype from Japan: Tokarajima Is. [error of Nakanoshima Is., pointed out by Yaginuma (1988)], Tokara Isls., depository cannot be traced, not examined].
Pseudicius tokaraensis: Ono et al. 2009, p. 570, fig. 107, ♀.
Icius koreanus: Bohdanowicz & Prószyński 1987, p. 67, figs. 67–71 [only male, nec Wesołowska 1981, misidentification].
Pseudicius koreanus: Ono et al. 2009, p. 570, figs. 104–105

Table 1. Spination of legs of *Pseudicius kimjoopili* (Kim 1995) comb. nov. (dorsal/ventral; none＝no spine, r＝retrolateral, p＝prolateral).

Leg		Femur	Patella	Tibia	Metatarsus
I	♂	1–1–2p/none	none/none	none/1–1,1p–1p	none/2–2
	♀	1–1–1/none	none/none	none/2–2–1p	none/2–2
II	♂	1–1–1,1p/none	none/none	none/1–1p	none/2–2
	♀	1–1–1/none	none/none	none/1	none/2–2
III	♂	1–1–1,1p/none	none/none	none/none	2/2,1p,1r
	♀	1–1–1/none	none/none	none/none	2/2,1p,1r
IV	♂	1–1–1,1r/none	none/none	none/1r	2/2,1p,1r
	♀	1–1–1/none	none/none	none/none	2/2,1p,1r

[only male, nec Wesołowska 1981, misidentification].

Pseudicius okinawaensis Prószyński 1992, p. 108, figs. 98–100 [female holotype from Japan Okinawa Is., deposited in Museum of Comparative Zoology, Harvard University, not examined]; Ono et al. 2009, p. 570, fig. 111, ♀. Syn. nov.

Specimens examined. Japan: Okinawa Pref.: 1♂ (NSMT-Ar 13046), Mt. Omoto-dake, Ishigaki Is., 8-IV-2013, H. Abe leg.; 3♀, Ibaruma, Ishigaki Is., 25-XI-2012 (1♀), 3-IV-2013 (2♀, 1♀: NSMT-Ar 13047), H. Abe leg.; 1♂ 1♀, Nago-shi, Okinawa Is., 18-V-2010, A. Tanikawa leg.; 1♂, Ishikawa, Uruma-shi, Okinawa Is., 26-X-2009, T. Suguro leg.; 1♂, Ikema, Miyako Is., 13-III-2010, T. Suguro leg.; 2♂, Nagura, Ishigaki Is., 23-XI-2012, H. Abe leg.; 1♀, Ôhama, Ishigaki Is., 16-III-2012, T. Suguro leg.; 1♀, Higawa, Yonaguni Is., 14-III-2012, T. Suguro leg.

Diagnosis. Compared with other Japanese *Pseudicius* species, this species can be easily distinguished by dark brown carapace with white stripes on the middle and lateral margins in both sexes, and elongate abdomen (Figs. 10, 11, 16, 18). Also, genital morphologies are characteristic: male palp with circular genital bulb, long spiniform embolus and long RTA (Figs. 20, 21); epigyne with a pair of elongate openings and a pair of pockets (Figs. 22, 23).

Description. Based on 1♂ (NSMT-Ar 13046, Fig. 16) and 1♀ (NSMT-Ar 13047, Fig. 18) from Japan.

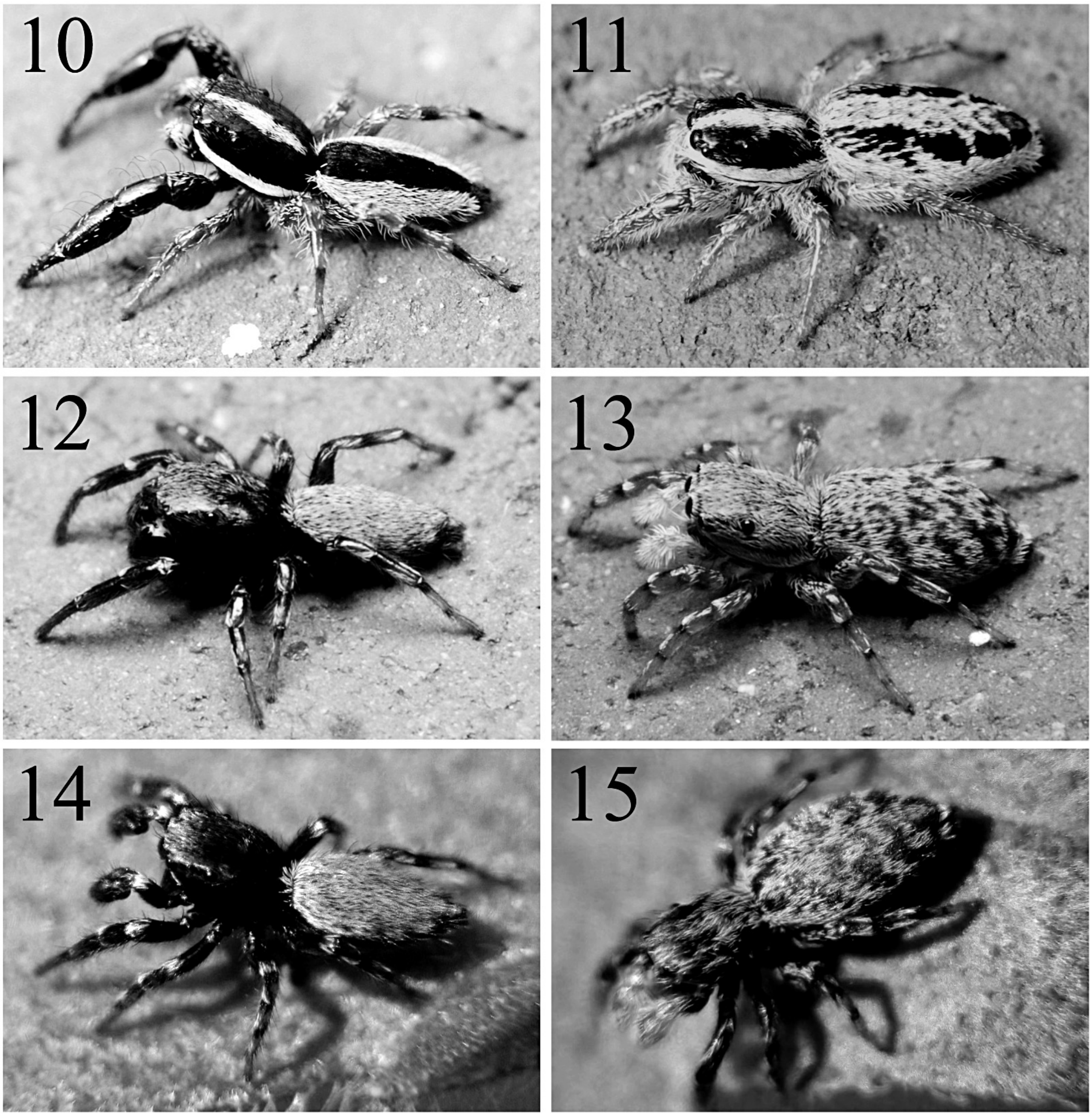
Male. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 4.80 (3.93–5.23) long; carapace 2.25 (1.80–2.28) long; 1.46 (1.20–1.56) wide; 0.82 (0.68–0.84) high; abdomen 2.55 (2.13–2.95) long; 1.36 (1.12–1.56) wide. Eye field: eye row I 1.12 (0.96–1.20) wide; eye row III 1.18 (1.02–1.24) wide; eye row 0.86 (0.76–0.86) long; distance between eye row I and II/length of eye row 0.56 (0.52–0.56); width of eye row I/width of eye row III 0.95 (0.94–0.98); AME diameter 0.37 (0.30–0.38); ALE/AME 0.52 (0.50–0.56); ALE/PLE 1.05 (1.00–1.05); PME/PLE 0.27 (0.20–0.27). Length of legs [femur＋patella＋tibia＋metatarsus＋tarsus＝total]: I 1.32＋0.93＋1.17＋0.83＋0.42＝4.67; II 0.95＋0.53＋0.58＋0.53＋0.33＝2.93; III 0.97＋0.50＋0.60＋0.67＋0.43＝3.17; IV 1.20＋0.62＋0.80＋0.75＋0.42＝3.78.

Carapace elongate and flat, height/width 0.56 (0.54–0.60), with short longitudinal fovea. Chelicera with two promarginal and one retromarginal teeth. Leg I remarkably thick, covered with sparse long hairs, bearing single spine on distinct tibial protuberance (Fig. 17). Spination of legs as shown in Table 2. Abdomen elongate.

Palp (Figs. 20–21). Embolus long and spiniform, originating at prolateral corner of bulb, and totally encircling bulb medially. Genital bulb circular, with protuberance on the middle. RTA long, composed of wide basal part and thin distal part.

Coloration and markings (Figs. 10, 16). Carapace mostly dark brown, covered with sparse brown hairs, with white longitudinal stripe fringed with white hairs on the middle and white line fringed with white hairs running along clypeus and lateral margins. Eye field black, with long black setae on front margin, bearing row of short black setae on lateral margin. Anterior eyes surrounded by thick brown hairs. Clypeus dark brown, with dense white hairs. Chelicera, maxilla and labium dark brown. Sternum greyish brown. Dorsum of abdomen dark greyish brown with sparse long black hairs, densely covered with white and black hairs: white ones forming a pair of thick longitudinal bands; black ones on the middle and lateral. Venter of abdomen greyish brown with sparse white hairs. Spinnerets greyish brown. Leg I entirely dark brown. Legs II-IV entirely yellowish brown. Palpal femur dark brown on basal part, bright brown on distal part. Palpal patella and tibia bright brown. Cymbium and genital bulb brown. Embolus black.

Female. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 5.58 (4.68–5.83) long; carapace 2.28 (2.00–2.28) long; 1.50 (1.32–1.50) wide; 0.88 (0.80–0.88) high; abdomen 3.30 (2.65–3.58) long; 1.76 (1.40–1.96) wide. Eye field: eye row I 1.18 (1.10–1.20) wide; eye row III 1.26 (1.16–1.26) wide; eye row 0.88 (0.82–0.88) long; distance between eye row I and II/length of eye row 0.55 (0.52–0.55); width of eye row I/width of eye row III 0.94 (0.93–0.95); AME diameter 0.38 (0.37–0.38); ALE/AME 0.52 (0.48–0.52); ALE/PLE 1.04 (1.00–1.10); PME/PLE 0.26 (0.23–0.27). Length of legs [femur＋patella＋tibia＋metatarsus＋tarsus＝total]: I 1.00＋0.72＋0.70＋0.50＋0.33＝3.25; II 0.87＋0.53＋0.52＋0.47＋0.33＝2.72; III 0.98＋0.50＋0.55＋0.65＋0.40＝3.08; IV 1.25＋0.63＋0.85＋0.77＋0.43＝3.93. Carapace elongate and flat, height/width 0.59 (0.59–0.62), with short longitudinal fovea. Chelicera with two promarginal and one



Figs. 10–15. Habitus. 10–11, *Pseudicius tokaraensis* (Bohdanowicz & Prószyński 1987) (10, male; 11, female); 12–15, *Tasa koreana* (Wesołowska 1981) comb. nov. (12, 14, male; 13, female; 15, male subadult, same individual as male adult of Fig. 14). (10, NSMT-Ar 13046; 11, NSMT-Ar 13047; 12, NSMT-Ar 13048; 13, NSMT-Ar 13049.)

retromarginal teeth. Leg I rather thick, bearing single spine on distinct tibial protuberance (Fig. 19). Spination of legs as shown in Table 2. Abdomen elongate.

Genitalia (Figs. 22, 24). Epigyne with a pair of elongate openings and a pair of pockets. Internal canal multi-coiled.

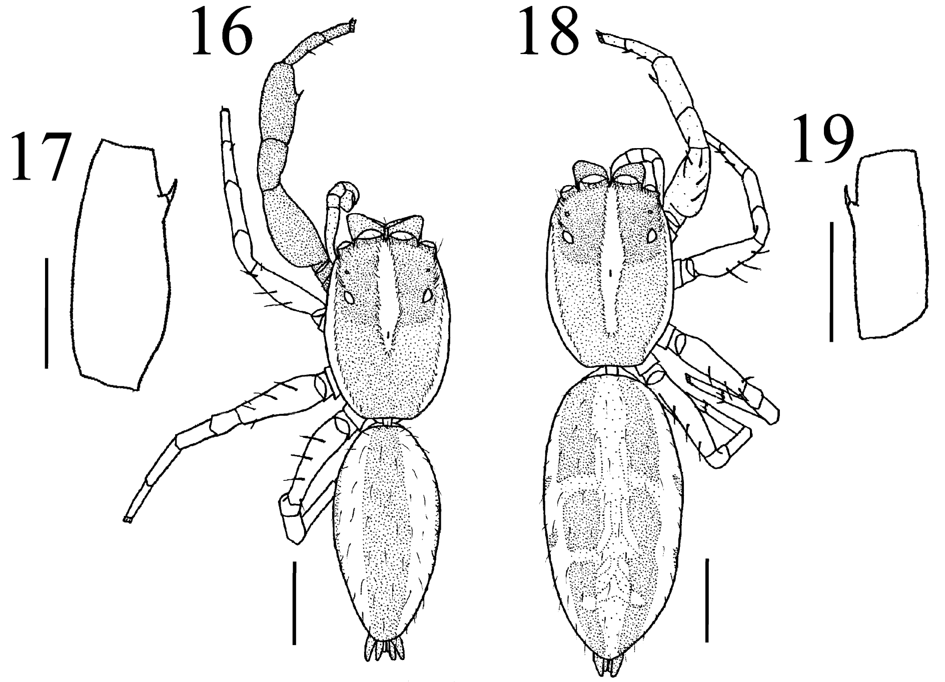
Coloration and markings (Figs. 11, 18). Carapace as male, but slightly lighter. Dorsum of abdomen dark greyish brown with sparse long black hairs, bearing some markings by dense hairs: a pair of thick black longitudinal bands divided into several parts, and a pair of white spots on the rear. Venter of abdomen yellowish white, covered with white hairs. Spinnerets greyish brown. Legs and palp entirely yellowish white except rather darker leg I.

Distribution. Japan: Shikoku, Ryukyu Isls.

Remarks. Male of this species was identified as *P. koreanus* by Bohdanowicz & Prószyński (1987). However, in this paper, conspecificity of male and female was supported by (1) sequencing data of mt-DNA COI gene, (2) spine on tibia I, and (3) white stripes on carapace. (1) See the section of "Phylogeny" in this paper. (2) Male and female of this species share the characteristic spine on tibia I: a single spine on distinct basal protuberance (Figs. 17, 19), whereas *P. koreanus* (transferred to the genus *Tasa* later) does not have such spines on tibia I. (3) Male and female of this species share the same white stripes on the middle of carapace and along clypeus and lateral margins of carapace (Figs. 10, 11), whereas *P. koreanus* does not have such markings.

Table 2. Spination of legs of *Pseudicius tokaraensis* (Bohdanowicz & Prószyński 1987). (dorsal/ventral; none=no spine, r=retrolateral, p=prolateral).

Leg		Femur	Patella	Tibia	Metatarsus
I	♂	none/none	none/none	none/1	none/2–2
	♀	1–1–1,1p/none	none/none	none/1	none/2–2
II	♂	1–1–1,1p/none	none/none	none/none	none/1–2
	♀	1–1–1,1p/none	none/none	none/none	none/2–2
III	♂	1–1–1,1p,1r/none	none/none	none/none	1/3
	♀	1–1–1,1p/none	none/none	none/none	1/3
IV	♂	1–1–1–1r/none	none/none	none/none	1/3
	♀	1–1–1/none	none/none	none/none	1/3



Figs. 16–19. *Pseudicius tokaraensis* (Bohdanowicz & Prószyński 1987). 16, 18, dorsal view; 17, 19, tibia I (16–17, male; 18–19, female). (16–17, NSMT-Ar 13046; 18–19, NSMT-Ar 13047.) Scales=1.0 mm (16, 18); 0.5 mm (17, 19).

P. okinawaensis Prószyński 1992 was described on the basis of difference against *P. tokaraensis* in the depth of epigynal pockets. However, the depth is not a crucial character because it shows a variation among individuals, even among right and left structures in the same individual (Figs. 22, 23). Thus, we regard this difference as intraspecific variation within *P. tokaraensis*, and *P. okinawaensis* is newly synonymized with *P. tokaraenesis*.

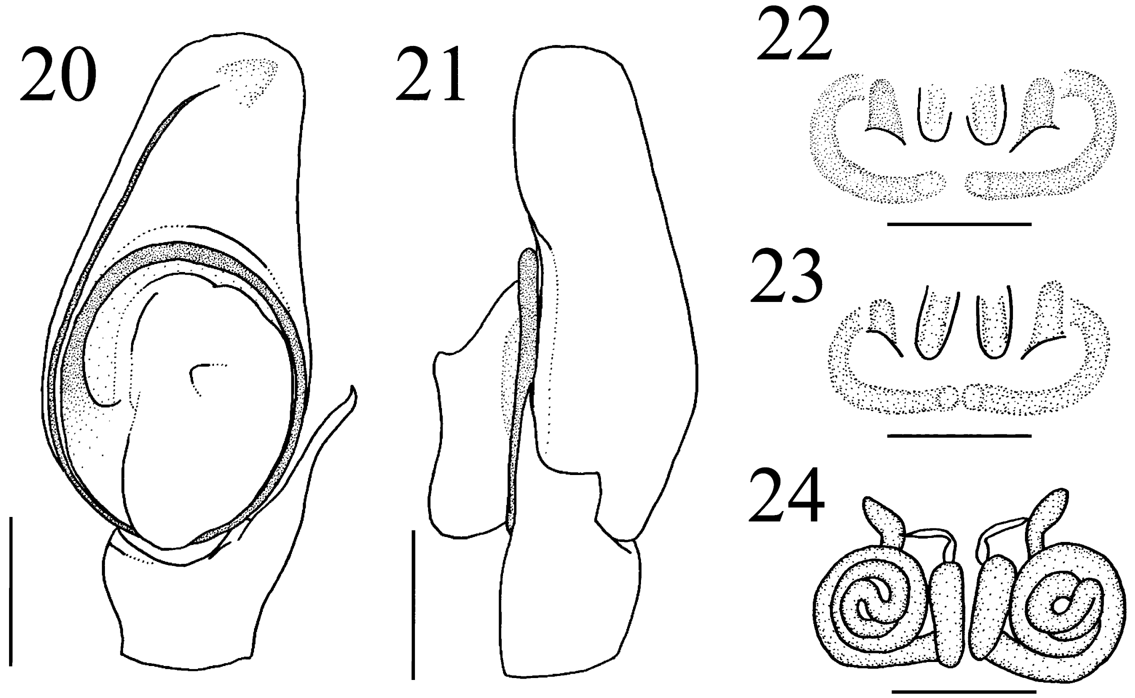
Genus *Tasa* Wesołowska 1981
[Japanese name: Tosa-haetorigumo-zoku]

Tasa Wesołowska 1981, p. 157 (Type species: *Thianella davidi* Schenkel 1963, from China: southern Schensi [probably Shaanxi Prov.]); Chen & Zhang 1991, p. 318; Peng et al. 1993, p. 230; Ikeda 1995, p. 163.

Diagnosis. Small spiders ranging from about 3.5 to 4.5 mm in length. Carapace rather elongate and flat. Chelicera with two promarginal and one retromarginal teeth. Abdomen rather elongate. Leg I well developed in male. Male palp showing following characters: genital bulb diamond-shaped; embolus thick, hook-shaped and running along retrolateral side of cymbium; genital bulb posteriorly projecting on prolateral part; RTA basically biramous with additional small teeth; femur ventrally with triangular protuberance. Epigyne simple and showing following characters: copulatory openings ovoid and located on posterior part; internal canal twisted in s-shaped.

Compared with other Japanese salticid genera, this genus resembles the genera *Helicius* and *Pseudicius* in general appearances, but can be distinguished by the genital morphology: male palp with thick embolus which is running along retrolateral side of cymbium; epigyne with ovoid openings which are located on posterior part.

Distribution. Japan, China, Korea.



Figs. 20–24. *Pseudicius tokaraensis* (Bohdanowicz & Prószyński 1987). 20–21, male palp (20, ventral view; 21, retrolateral view); 22–23, epigyne; 24, female internal genitalia, dorsal view. (20–21, NSMT-Ar 13046; 22, 24, NSMT-Ar 13047.) Scales = 0.2 mm.

Tasa koreana (Wesołowska 1981) **comb. nov.**
[Japanese name: Tosa-haetori]
(Figs. 12–15; 25–30)

Pseudicius koreanus Wesołowska 1981, p. 60, figs. 52–55 [female holotype from North Korea: Pyeongyang, deposited in Institute of Zoology of the Polish Academy of Science in Warszawa, not examined]; Peng et al. 1993, p. 192, figs. 677–679; Song et al. 1999, p. 542, f. 313O; Yin et al. 2012, p. 1451, figs. 791a–I [only female; male misidentified = unknown species]; Ono et al. 2009, p. 570, fig. 106 [only female; male misidentified = *P. tokaraensis*]

Icius koreanus: Yaginuma 1986, p. 233, fig. 130.1, ♀; Bohdanowicz & Prószyński 1987, p. 67, figs. 72–73 [only female; male misidentified = *P. tokaraensis*].

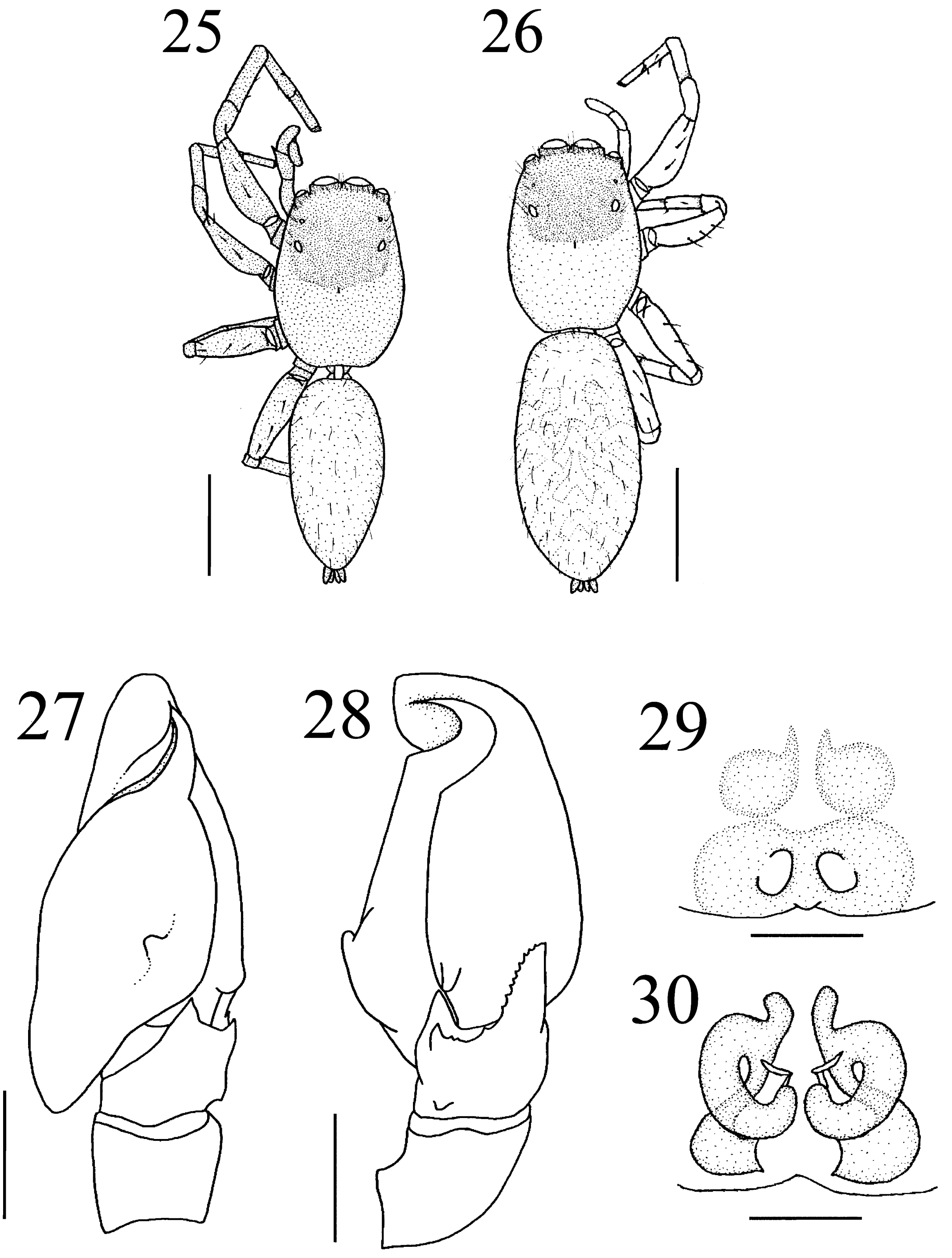
Tasa nipponica Bohdanowicz & Prószyński 1987, p. 143, figs. 300–303 [male holotype from Japan: Kochi Pref., depository cannot be traced, not examined]; Chen & Zhang 1991, p. 318, fig. 339, ♂; Seo 1992, p. 183, figs. 13–16, ♂; Ikeda 1995, p. 163, figs. 15–20, ♂; Song et al. 1999, p. 561, figs. 319N–O, ♂; Cho & Kim 2002, p. 136, figs. 89, 198–199, ♂; Namkung 2002, p. 590, fig. 43. 34, ♂; Namkung 2003, p. 594, fig. 43. 34, ♂; Ono et al. 2009, p. 574, figs. 149–153, ♂. **Syn. nov**.

Specimens examined. 1♀, Naksan-ri, Jicheon-myeon, Chilgok-gun, Gyeongsangbuk-do, South Korea, 9-VI-2012, T. Suguro leg. Other than this female, all the specimens were collected in Japan. Tokyo: 6♂ 3♀ (1♂: NSMT-Ar 13048, 1♀: NSMT-Ar 13049), Kasai Rinkai Park, Edogawa-ku, 16-V-2013, K. Arai & T. Suguro leg.; 1♂, same locality, 30-VI-2012, T. Shinozaki leg.; 1♂, same locality, 29-III-2013, K. Arai leg. (collected as a juvenile, and became an adult after rearing); 1♂ 1♀, Tamagawadai Park, Ôta-ku, 10-V-2013 (1♂), 17-V-2013 (1♀), T. Kunisue leg. Ibaraki Pref.: 7♂ 2♀, Amakubo, Tsukuba-shi, 1-V-2013 (1♂), 9-V-2013 (1♂), 10-V-2013 (1♂), 13-V-2013 (3♂), 17-V-2013 (1♂), 21-V-2013 (1♀), 28-V-2013 (1♀), T. Suguro leg. Kanagawa Pref.: 1♂, Shiboku-honchô, Miyamae-ku, Kawasaki-shi, 25-V-2013, T. Suguro leg.

Diagnosis. This species closely resembles *T. davidi* (Schenkel 1963), but males of this species can be distinguished from the latter by the thick ventral branch of RTA, whereas that of *T. davidi* is needle-shaped (Wesołowska 1981; Ikeda 1995). Females of this species are hardly discriminable from those of *T. davidi* (Peng et al. 2000).

Description. Based on 1♂ (NSMT-Ar 13048, Fig. 25) and 1♀ (NSMT-Ar 13049, Fig. 26) from Japan.

Male. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 4.05 (3.32–4.05) long; carapace 1.90 (1.56–1.90) long; 1.32 (1.10–1.33) wide; 0.75 (0.63–0.75) high; abdomen 2.15 (1.70–2.28) long; 1.20 (0.98–1.38) wide. Eye field: eye row I 0.97 (0.83–0.97) wide; eye row III 1.00 (0.88–1.02) wide; eye row 0.72 (0.60–0.72) long; distance between eye row I and II/length of eye row 0.51 (0.49–0.53); width of eye row I/width of eye row III 0.97 (0.92–0.98); AME diameter 0.30 (0.27–0.30); ALE/AME 0.50 (0.47–0.56); ALE/PLE 1.00 (0.89–1.00); PME/PLE 0.22 (0.22–0.24). Length of legs [femur + patella + tibia + metatarsus + tarsus = total]: I 1.00 + 0.68 + 0.80 + 0.57 + 0.38 = 3.43; II 0.80 + 0.52 + 0.53 +



Figs. 25–30. *Tasa koreana* (Wesołowska 1981) comb. nov. 25–26, dorsal view (25, male; 26, female); 27–28, male palp (27, ventral view; 28, retrolateral view); 29, epigyne; 30, female internal genitalia, dorsal view. (25, 27–28, NSMT-Ar 13048; 26, 29–30, NSMT-Ar 13049.) Scales = 1.0 mm (25–26); 0.2 mm (27–30).

0.47 + 0.33 = 2.65; III 0.80 + 0.43 + 0.50 + 0.52 + 0.40 = 2.65; IV 0.97 + 0.50 + 0.68 + 0.67 + 0.38 = 3.20.

Carapace elongate and flat, height/width 0.57 (0.55–0.59), with short longitudinal fovea. Chelicera with two promarginal and one retromarginal teeth. Spination of legs as shown in Table 3. Abdomen rather elongate.

Palp (Figs. 27–28). Embolus thick and hook-shaped. Genital bulb posteriorly projecting on prolateral part. RTA basically biramous, with small tooth on retrolateral side, serrate along concaved margin of dorsal branch in retrolateral view.

Coloration and markings (Figs. 12, 25). Carapace mostly dark brown, covered with sparse black and white hairs. Eye field blackish brown and surrounded by sparse black setae.

Table 3. Spination of legs of *Tasa koreana* (Wesołowska 1981) comb. nov. (dorsal/ventral; none=no spine, r=retrolateral, p=prolateral).

Leg		Femur	Patella	Tibia	Metatarsus
I	♂	1–1–1,1p/none	none/none	none/1–1	none/2–2
	♀	1–1–1/none	none/none	none/none	none/2–2
II	♂	1–1–1,1p/none	none/none	none/none	none/1–2
	♀	1–1–1/none	none/none	none/none	none/1–2
III	♂	1–1–3/none	none/none	none/1r–1	2/3
	♀	1–1–1/none	none/none	none/1	2/3
IV	♂	1–1–1–2/none	none/none	none/1–2	2/3
	♀	1–1–1/none	none/none	none/2	2/3

Anterior eyes surrounded by thick white hairs. Clypeus dark brown with long black hairs. Chelicera brown. Labium and maxilla dark yellowish brown. Sternum dark brown. Abdomen entirely dark brown, covered with black and white hairs. Spinnerets greyish brown. Leg I entirely dark brown. Leg II mostly yellowish brown, dark-colored on whole of femur, and basal ends of tibia and metatarsus. Legs III and IV mostly yellowish brown, dark-colored on whole of femora, basal ends of tibiae, and basal and distal ends of metatarsi. Palp dark brown.

Female. Measurements (in mm; measurements in parentheses indicate the range among specimens examined). Body 3.81 (3.63–4.48) long; carapace 1.66 (1.66–1.80) long; 1.17 (1.13–1.25) wide; 0.68 (0.68–0.72) high; abdomen 2.15 (1.95–2.80) long; 1.33 (1.25–1.63) wide. Eye field: eye row I 0.92 (0.90–0.95) wide; eye row III 1.00 (0.97–1.02) wide; eye row 0.68 (0.67–0.70) long; distance between eye row I and II/length of eye row 0.51 (0.50–0.53); width of eye row I/width of eye row III 0.92 (0.90–0.95); AME diameter 0.30 (0.28–0.32); ALE/AME 0.50 (0.47–0.53); ALE/PLE 1.00 (1.00–1.00); PME/PLE 0.22 (0.22–0.22). Length of legs [femur+patella+tibia+metatarsus+tarsus=total]: I 0.73+0.48+0.48+0.35+0.30=2.35; II 0.67+0.42+0.40+0.35+0.25=2.08; III 0.72+0.38+0.43+0.45+0.35=2.33; IV 0.97+0.48+0.65+0.60+0.38=3.08.

Carapace elongate and flat, height/width 0.59 (0.56–0.60), with short longitudinal fovea. Chelicera with two promarginal and one retromarginal teeth. Spination of legs as shown in Table 3. Abdomen elongate.

Genitalia (Figs. 29–30). Epigyne with a pair of oval distinct copulatory openings. Internal canal twisted in s-shaped in dorsal and ventral view, visible through epigynal surface.

Coloration and markings (Figs. 13, 26). Carapace reddish brown on thorax, bright brown on lateral, entirely covered with dense white hairs. Eye field dark brown and surrounded by sparse black setae. Clypeus brown with long white hairs. Chelicera brown. Maxilla bright brown. Labium and sternum greyish brown. Dorsum of abdomen greyish brown, covered with dense grey and dark brown hairs: grey ones forming several chevrons along the midline. Venter of abdomen greyish brown, covered with grey hairs. Spinnerets greyish brown. Legs mostly yellowish white except some darker part: patella to tarsus I bright brown; basal ends of tibiae and metatarsi III and IV dark yellowish brown. Palp bright brown.

Distribution. Japan: Honshu, Shikoku; China, Korea.

Remarks. Male and female of this species were described as different species, male as *Tasa nipponica* Bohdanowicz & Prószyński 1987 and female as *Pseudicius koreanus* Wesołowska 1981. In the present study, the conspecificity of male and female was supported by (1) sequencing data of mt-DNA COI gene and (2) markings of male subadult. (1) See the section of "Phylogeny" in this paper. (2) Male subadult (Fig. 15, become adult of Fig. 14 after rearing) of this species has very similar markings to those of female adult (Fig. 13). We therefore consider these male and female belong to single species, then consequently, *T. nipponica* is newly synonymized with *P. koreanus*.

Since male palpal morphology of this species is characteristic and closely resembles that of *Tasa davidi*, type species of the genus *Tasa*, this species is worth belonging to the genus *Tasa*, not *Pseudicius*. Therefore, diagnostic characters of female of this genus are described for the first time.

It is doubtful whether the female specimens identified as *T. davidi* by Peng et al. (2000) certainly belong to *T. davidi* because the female figures very closely resembles female of *T. koreana*. It is necessary to examine specimens from the type locality (Shaanxi Prov.?).

The male specimen identified as *T. koreana* (originally as *Icius koreanus*) in Xiao (1993) are obviously different from *T. koreana*, although we did not examine the specimens used in Xiao (1993). Again, the difference between the male in Xiao (1993) and the male in Bohdanowicz & Prószyński (1987) (identified as *P. tokaraensis* in this paper) is easily recognizable by comparison of descriptions and figures. *Icius koreanus* recorded in Xiao (1993) is, therefore, excluded from the synonym list of both *P. tokaraensis* and *Tasa koreana*. The male specimen in Xiao (1993) should belong to a different species, and the identification is needed in the future.

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Appendix. DDBJ/EMBL/GenBank accession numbers of sequence data analysed in this study. Male *Pseudicius koreanus* (sensu Bohdanowicz & Prószyński 1987) was identified as *P. tokaraensis* in this paper. Also male of *Tasa nipponica* was identified as the correct male of *P. koreanus*, and *P. koreanus* was transferred to the genus *Tasa* in this paper. *Helicius kimjoopili* was transferred to the genus *Pseudicius* in this paper.

Species	Sampling data	Accession No.
Male *Tasa nipponica*	Amakubo, Tsukuba-shi, Ibaraki Pref., 1-V-2013, T. Suguro leg.	AB924443
Male *Tasa nipponica*	Kasai Rinkai Park, Edogawa-ku, Tokyo, 16-V-2013, K. Arai & T. Suguro leg.	AB924442
Female *Pseudicius koreanus*	Naksan-ri, Jicheon-myeon, Chilgok-gun, Gyeongsangbuk-do, South Korea, 9-VI-2012, T. Suguro leg.	AB924440
Female *Pseudicius koreanus*	Kasai Rinkai Park, Edogawa-ku, Tokyo, 16-V-2013, K. Arai & T. Suguro leg.	AB924441
Male *Pseudicius koreanus* sensu Bohd. & Pros. 1987	Nagura, Ishigaki Is., Okinawa Pref., 23-XI-2012, H. Abe leg.	AB924444
Female *Pseudicius tokaraensis*	Ibaruma, Ishigaki Is., Okinawa Pref., 3-IV-2013, H. Abe leg.	AB924445
Pseudicius vulpes	Shishizuka, Tuchiura-shi, Ibaraki Pref., 18-V-2013, T. Suguro leg.	AB924446
Helicius chikunii	Kasai Rinkai Park, Edogawa-ku, Tokyo, 16-V-2013, T. Suguro leg.	AB924449
Helicius cylindratus	Shishizuka, Tuchiura-shi, Ibaraki Pref., 18-V-2013, T. Suguro leg.	AB924447
Helicius yaginumai	Hamochi-Hongô, Sadogashima Is., Niigata Pref., 15-VII-2013, T. Suguro leg.	AB924448
Male *Helicius kimjoopili*	Shiboku-honchô, Miyamae-ku, Kawasaki-shi, Kanagawa Pref., 25-V-2013, T. Suguro leg.	AB924450
Female *Helicius kimjoopili*	Shiboku-honchô, Miyamae-ku, Kawasaki-shi, Kanagawa Pref., 25-V-2013, T. Suguro leg.	AB924451